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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new zenith looking narrow-band radiometer based system (ZEN) for dust Aerosol Optical Depth monitoring" *by* A. Fernando Almansa et al.

Anonymous Referee #2

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General comments:

The manuscript presents a new aerosol measurement system consisting on a zenith looking narrow-band radiometer (ZEN-R41) and an AOD retrieval methodology based on look-up tables (ZEN-LUT) computed with the LibRadTran model and OPAC database.

The study includes a sensitivity analysis of the retrieved AOD with instrumental and RTM input uncertainties, and a validation against state of the art sunphotometers such as Cimel CE318 in different sites dominated by dust conditions.

The instrument does not have mobile parts, being robust and therefore, well suited for

the applications named in the manuscript. The results for the three sites are relatively good, taking into account the system limitations.

The text, figure and tables are concise but clear. The English style is readable, without major grammar or ortographic flaws.

This manuscript is also very suited for AMT journal, so my recommendation is to accept the paper after some suggestions are addressed.

Specific questions and comments:

- In the abstract, a mention to the sensitivity analysis with an estimation of the inherent system uncertainty would be useful.

- Page 5, line 4: how do you interpolate the radiance in the PPL for retrieving the ZSR? Do you use only two or more angles? Linear or non-linear approach?

- Page 5, line 12: please add some details about the cloud cover algorithm, if they are not included in the previous reference

- Dusting of the sensor windows could be an error source, mainly when the window is horizontal and unprotected under strong dust episodes. How this issue has been addressed in the three sites?

- Page 6, line 13: The calibration of the instrument, has been performed for only one radiance level?

- Page 6, line 20: how the ZEN FOV has been taken into account when building up the LUT? This could be more important when the SZA is lower, as the variation of the radiation field within the instrument FOV is larger.

- Page 11, line 6: in tamanrasset site it is not possible to screen the clouds in the zenith because there is no sky camera available. Therefore, the authors apply the TT method to the AOD series. This is a valid solution. However, later it is said that the higher differences found in Tamanrasset could be due to the abscence of a robust

cloud screening method. Why not using the PPL information to improve the results for Tamanrasset data? I suggest using the information derived from the interpolation of radiance at the zenith (that's one more reason to use more than two points for the interpolation, as suggested before) as an auxiliary tool for rejecting ZSR data affected by clouds. Otherwise, could deposited dust be another reason for a higher deviation at this site?

Technical or minor comments:

- Page 2, lines 35: although the reviewer agrees that the tracking system from cimel increases the power consumption, solar panels are sufficient to feed the instrument, without a need to be connected to an electric grid.

- Page 3, lines 27-30. It looks like a very long sentence, consider to rewrite it in two different sentences.

- page 4, line 24: consider more recent references for the Dubovik code.

- page 4, line 29: to be accurate, the measurements are performed in the solar almucantar plane, where the almucantar zenith angle is equal to the solar zenith angle. Same for PPL.

- Page 6, line 27: but still within the combined uncertainty from ZEN and Cimel

- Page 10, line 11: this information could be shown in a Figure (as with the other cases)

- Page 10, line 19: Figure 3 -> 4?

- page 11, line 20: TamaNrasset

- Sometimes R2 is used in the text, R in the figures. Please use the same.

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